

Study Guide and Intervention

7NS2.3, 7AF2.1, 7AF2.2

Multiplying Monomials

The **Product of Powers Property** states that to multiply powers that have the same base, add the exponents: $a^n \cdot a^m = a^{n+m}$.

Example Multiply. Express using exponents.

1

$2^3 \cdot 2^2$

$$2^3 \cdot 2^2 = 2^{3+2}$$

$$= 2^5$$

The common base is 2.
Add the exponents.

2

$-2s^6(-7s^7)$

$$-2s^6(-7s^7) = (-2 \cdot -7)(s^6 \cdot s^7)$$

$$= (14)(s^{6+7})$$

$$= 14s^{13}$$

Commutative and Associative Properties
The common base is s .
Add the exponents.

3

$n^5 - n^{-3}$

$$n^5 - n^{-3} = n^{5-3}$$

$$= n^2$$

The common base is n .
Subtract the exponents.

Exercise**Multiply. Express using exponents.**

1. $3^4 \cdot 3^1$

2. $5^2 \cdot 5^5$

3. $e^2 \cdot e^7$

4. $2a^5 \cdot 6a$

5. $-3t^3 \cdot 2t^8$

6. $4x^2(-5x^6)$

7. $-6t^4 \cdot -3t^5$

8. $\left(\frac{3}{4}\right)^{-3} \cdot \left(\frac{3}{4}\right)^6$

9. $-6m^2 \cdot 4m$

10. $3s^6(-9s^{-2}h^2)$

11. $9a^2(-6a^{-5})$

12. $-2e^4z^{-4}(6e^{-6})$

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Dividing Monomials

The Quotient of Powers Property states that to divide powers that have the same base, subtract the exponents: $a^n \div a^m = a^{n-m}$.

Example Divide. Express using exponents.

1

$$\frac{k^8}{k}$$

$$\frac{k^8}{k} = k^{8-1}$$
$$= k^7$$

The common base is k .
Subtract the exponents.

2

$$\frac{28g^{12}}{-4g^3}$$

$$\frac{28g^{12}}{-4g^3} = \left(\frac{28}{-4}\right)\left(\frac{g^{12}}{g^3}\right)$$

$$= (-7)(g^{12-3})$$
$$= -7g^9$$

Commutative and Associative Properties

The common base is g .
Subtract the exponents.

3

$$\frac{5^8}{5^{-5}}$$

$$\frac{5^8}{5^{-5}} = 5^{8-(-5)}$$

$$= 5^{13}$$

Quotient of Powers.

Simplify.

Exercise

Divide. Express using exponents.

1. $\frac{2^8}{2^6}$

2. $\frac{7^9}{7^3}$

3. $\frac{v^{14}}{v^6}$

4. $\frac{15w^7}{5w^2}$

5. $\frac{21z^{10}}{7z^9}$

6. $\frac{10m^8}{2m}$

7. $\frac{(-12)^3}{(-12)^3}$

8. $\frac{c^{20}}{c^{13}}$

9. $\frac{1^8}{1^6}$

10. $\frac{x^{-2}}{x^{-4}}$

11. $\frac{100^7}{100^6}$

12. $\frac{4^{-2}}{4^6}$

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Powers of Monomials**Rule:** To find the power of a power, multiply the exponents.**Rule:** To find the power of a product, find the power of each factor and multiply.**Example 1****Simplify to find the power of the power:**

$$\begin{aligned} & (5^3)^6 \\ & (5^3)^6 = 5^3 \cdot 6 \\ & = 5^{18} \end{aligned}$$

Example 2**Simplify to find the power of each factor.**

$$\begin{aligned} & (-3m^2n^4)^3 \\ & (-3m^2n^4)^3 = (-3)^3 \cdot m^{2 \cdot 3} \cdot n^{4 \cdot 3} \\ & = -27m^6n^{12} \end{aligned}$$

Exercise**Simplify to find the power of the power.**

1. $(4^3)^5$

2. $(4^2)^7$

3. $(9^2)^4$

4. $(k^4)^2$

5. $[(6^3)^2]^2$

6. $[(3^2)^2]^3$

Simplify to find the power of each product.

7. $(5q^4r^2)^5$

8. $(3y^2z^2)^6$

9. $(7a^4b^3c^7)^2$

10. $(-4d^3e^5)^2$

11. $(-5g^4h^9)^7$

12. $(0.2k^8)^2$

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Roots of Monomials

The **square root** of a monomial is one of the two equal factors of the monomial.

Example 1 Simplify $\sqrt{25a^4}$.

$$\begin{aligned}\sqrt{25a^4} &= \sqrt{25} \cdot \sqrt{a^4} \\ &= 5 \cdot a^2\end{aligned}$$

Product Property of Square Roots

Absolute value is not necessary since the value of a^2 will never be negative.

Example 2 Simplify $\sqrt{49y^6z^8}$.

$$\begin{aligned}\sqrt{49y^6z^8} &= \sqrt{49} \cdot \sqrt{y^6} \cdot \sqrt{z^8} \\ &= 7 \cdot |y^3| \cdot z^4\end{aligned}$$

Product Property of Square Roots

Use absolute value to indicate the positive value of y^3 .

The **cube root** of a monomial is one of the three equal factors of the monomial.

Example 3 Simplify $\sqrt[3]{d^6}$.

$$\sqrt[3]{d^6} = d^2$$

$$(d^2)^3 = d^6$$

Example 4 Simplify $\sqrt[3]{125m^9n^{12}}$.

$$\begin{aligned}\sqrt[3]{125m^9n^{12}} &= \sqrt[3]{125} \cdot \sqrt[3]{m^9} \cdot \sqrt[3]{n^{12}} \\ &= 5 \cdot m^3 \cdot n^4\end{aligned}$$

Product Property of Cube Roots

$$(5)^3 = 125; (m^3)^3 = m^9; \text{ and } (n^4)^3 = n^{12}$$

Exercises**Simplify.**

1. $\sqrt{c^2}$

2. $\sqrt{4s^6}$

3. $\sqrt{16a^8b^{12}}$

4. $\sqrt{64g^8h^{10}}$

5. $\sqrt{36r^2s^6}$

6. $\sqrt{121d^4e^{10}}$

7. $\sqrt[3]{p^6}$

8. $\sqrt[3]{27m^{15}}$

9. $\sqrt[3]{216a^9b^{21}}$

10. $\sqrt[3]{64y^{12}z^{24}}$

11. $\sqrt[3]{343t^{18}u^6}$

12. $\sqrt[3]{125p^{15}q^{27}}$